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FOSSIL PLANTS FROM KILLARA, NEAR CASTERTON, VICTORIA

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Introduction

The plants described below were collected by Messrs. P. R. Kenley, A. N. Carter, and D. Spencer-Jones from the cliffs of the Glenelg River, at the scar of a large landslip in Allotment 4, Section A, Parish of Killara. An outline of the stratigraphy has been prepared by Mr. P. R. Kenley.

Plants occur at two distinct horizons. The lower plant bed—the Mocomboro mudstone member—consists of 24 feet of blue-grey to white laminated mudstones containing abundant plant impressions. This is separated by a disconformity from the overlying 41 feet of grey white felspathic sandstones and 23 feet of grey-blue to white mudstones which constitute the Runnymede Formation. The upper white mudstones of the Runnymede Formation also contain abundant plant remains. These are immediately overlain by an unconformity which separates these beds from the Tertiary.

The material consists of impressions only, and no details of cuticular structure are available, but the outline and venation of the leaves are well preserved.

Systematic Description of Species

A. Plants from the Mocomboro Mudstone Member, Killara

Pteropsida

Plants of unknown affinity

Phyllopteroides n. gen.

Diagnosis: Leaves simple, linear-lanceolate; margins dentate or entire; midrib prominent, lateral veins leaving midrib at an acute angle and dividing dichotomously once or twice at varying distances from the margin, not anastomosing. Epidermal cells polygonal in outline.

Remarks: The leaves resemble *Phyllopteris* Walkom 1919 and *Linguifolium* Arber 1917. Some confusion has arisen regarding the genera *Phyllopteris* Brongniart, *Sagenopteris* Presl, and *Linguifolium* Arber, and the position has been discussed at length by Arber (1917, pp. 35-38) and by Walkom (1919, pp. 21-22). *Sagenopteris* Presl is distinctive in the possession of anastomoses of the secondary veins, and thus may be separated easily from the other two forms. *Phyllopteris* Brongniart is a true synonym for *Sagenopteris* Presl, as the term was originally applied wrongly to specimens of *Sagenopteris phillipsi* Brongniart and *Sagenopteris rhoifolia* Presl. The genus was founded under the misapprehension that the veins of these specimens did not anastomose, the mistake arising from inaccuracies in earlier illustrations.

Although specimens were found, many years later, which agree with the diagnosis given by Brongniart, it would be unwise to apply the old term to these

new forms. Arber proposed that the genus *Phyllopteris* should lapse, and instituted a new genus, *Linguifolium,* for leaves from the New Zealand Rhaetic of Mount Potts and ?Lower Jurassic of Malvern Hills (?Middle Jurassic, Edwards 1934). *Linguifolium* Arber is provisionally defined as follows:

"Leaves simple, large, usually tongue-shaped, gradually contracted at the base, margins entire. Midrib strong; lateral nerves arising at a very acute angle to the midrib, more or less arched, frequently dichotomising but not anastomosing." (Arber 1917, p. 35.)

In this opinion, Arber is supported by Jones and de Jersey (1947), who described and figured two species of *Linguifolium* from the Ipswich of Queensland. Specimens from the ?Rhaetic of Talcamavide and La Terna, southern Chile, and Tchuantepec, southern Mexico, were examined by Berry (1945), who also upholds the validity of the new genus. From Tasmania, Walkom (1925a) described *Linguifolium lillieanum* Arber and *Linguifolium diemenense* Walkom.

However, from the Burrum Series of Queensland, Walkom described specimens which are not identical with *Linguifolium* Arber as defined above. Walkom (1919) pointed out that the position of *Phyllopteris* was clearly defined by Saporta (1873), and thus no confusion need arise. He proposed that *Phyllopteris,* as used by Saporta, be applied to Australian plants including *Phyllopteris feistmantcli* Etheridge and the two species from the Burrum Series—*Phyllopteris lanceolata* Walkom 1919 and *Phyllopteris expansa* Walkom 1919. *Phyllopteris* was defined as follows:

"Leaves simple, more or less lanceolate, having a short petiole and entire or denticulate margin; median vein becoming thin towards the apex; secondary veins springing from the midrib at an acute angle, distinctly arched and dividing dichtomously, not anastomosing." (Walkom 1919, p. 22.)

I agree with Walkom that the definition of *Linguifolium* is not sufficiently wide to include the Australian forms cited above, but feel that a name other than *Phyllopteris* should be applied to them. I therefore propose to base a new genus, *Phyllopteroides,* on the material from Killara, and to suggest the inclusion in this genus of *Phyllopteroides lanceolata* (Walkom 1919), and *Phyllopteroides expansa* (Walkom 1919).

Phyllopteroides dentata n. sp.

Holotype: Geology Department, University of Melbourne, No. 2005.

Diagnosis: Leaf linear lanceolate, narrowing gradually towards the base, apex rounded. Margin dentate, dentation less marked at the apex. Midrib strong, straight, 1 mm. at the base, not persisting to the apex; lateral veins generally opposite, leaving midrib at an acute angle, arching, and bifurcating at varying distances from the margin; about four veins per tooth at margin.

Description: The specimens are preserved in a soft clay, and when examined under strong light, the outline of regularly polygonal epidermal cells may be seen. No material suitable for cuticular study was found.

The leaves range in length from 3 to 8 cm., averaging about 5 cm., and are from 0·5 to 1·5 cm. broad. They were very delicate, and in many cases were torn parallel to the secondary veins, giving an appearance similar to that of a *Sphenopteris* frond. The leaves always occur singly, and no good example of a leaf base was seen.

Phyllopteroides expansa Walkom 1919

1919. *Phyllopteris expansa* Walkom. *Qld. Geol. Surv. Publ.*, 263: 24. Pl. 5, figs. 1, 2.

Larger, more delicate leaves occur with *Phyllopteroides dentata*, but as they are so abundant, and overlap considerably, it is difficult to be sure of their identity. No frond or pinna is seen, but the large torn leaves, with strongly arched veins, are probably identical with *Phyllopteris expansa* Walkom 1919. *Phyllopteris lanceolata* Walkom 1919 is a much neater leaf.

Taeniopteris spatulata Oldham and Morris 1863

(For synonymy see Medwell 1954.)

A small specimen of *Taeniopteris spatulata* occurs in the Mocomboro mudstone member at Killara. It is a very narrow leaf, 3 mm. wide, with a midrib of 1 mm. The secondary veins leave the midrib at right angles, and bifurcate at varying distances from the margin.

Sphenopteris sp.

A fragment of a frond resembling *Sphenopteris* bears alternate pinnules of rather subspathulate shape, narrowing to wedge shape at the base, with a finely serrate margin. The venation is typically Sphenopteroid.

This form is not the *Sphenopteris hislopi* Oldham and Morris 1863 of the Jurassic of Victoria, but is really too fragmentary to allow accurate specific identification.

Genus Indeterminate

Isolated leaves or pinnules of variable rounded or fan-shaped outline occur with the *Sphenopteris sp.* described above. These narrow abruptly at the base to a distinct petiole. There is no indication of a frond, although in one specimen the union of two petioles is seen.. The margin is finely serrate, and veins radiate from the base, bifurcating once or twice before reaching the margin. These leaves resemble an unlobed *Ginkgo*, but their affinities are unknown.

CONIFEROPHYTA
CONIFERALES
ARAUCARINEAE

Brachyphyllum sp.

Portion of a coniferous shoot, very imperfectly preserved, is probably a *Brachyphyllum*, but is insufficient for specific determination.

B. PLANTS FROM THE UPPER MUDSTONE HORIZON OF THE RUNNYMEDE FORMATION

PTEROPSIDA
PLANTS OF UNKNOWN AFFINITY

Phyllopteroides lanceolata Walkom 1919

1919. *Phyllopteris lanceolata* Walkom. *Qld. Geol. Surv. Publ.*, 263: 22.

Isolated pinnules of broadly ovate outline, narrowing abruptly at the base to a short petiole, margin entire. The midrib does not persist to the apex, and secondary veins leave at an acute angle, arching to the margin, generally dichotomising.

These specimens bear a very close resemblance to *Phyllopteris lanceolata* Walkom 1919, which, Walkom states, is one of the commonest and most characteristic plants in the Burrum Series of Queensland. They are probably also present in the lower plant horizon at Killara, but the abundance of specimens in this bed makes identification of all fragments difficult.

It is to be stressed that the genus *Phyllopteroides* is an artificial one, as it is based wholly on leaf form and venation.

Sphenopteris cf. Sphenopteris burrumensis Walkom 1919

1919. *Sphenopteris burrumensis* Walkom. *Qld. Geol. Surv. Publ.*, 263: 19. Pl. 1, fig. 5.

Numerous fragments of *Sphenopteris* occur, which in pinnule shape appear close to the Burrum species, although no complete pinnae are found. Isolated pinnules vary in shape from the usual trilobed wedge shape to short rounded almost odontopteroid forms, and may most conveniently be linked with Walkom's species.

CONIFEROPHYTA

GINKGOALES

? Czekanowskia

A fragment of narrow, uninerved, dichotomising lamina may be placed either in this genus or in *Stenopteris,* but in the absence of cuticle is too small to be determined.

Phoenicopsis elongatus (Morris 1845) Seward 1903

(For synonymy see Walkom 1917b.)

1947. *Phoenicopsis elongatus* (Morris) Seward, Jones and de Jersey. *Qld. Univ. Publ.,* 111 (N.S.) : 62.

The specimens from Killara consist of single, long, linear leaves, 5-6 mm. wide, tapering to a finely rounded apex; veins 9-10, parallel, not dichotomous; base of the leaf not seen.

The material most resembles *Phoenicopsis steenstrupi* Seward 1926, now placed by Florin (1936) in the genus *Culgoweria* on the basis of epidermal structure. As the cuticle of the Victorian form is unknown, it can not be placed in *Culgoweria. Culgoweria steenstrupi* occurs in the Cretaceous of Angiarsuit, Western Greenland.

Phoenicopsis elongatus has been described from many eastern Australian Mesozoic localities, and the Killara material is provisionally placed in this form genus and species.

CONIFERALES

ARAUCARINAE

Araucarites cutchensis Feistmantel 1876

Well preserved isolated cone scales of *Araucarites* vary in shape from short, broadly winged, to longer and narrower forms, but this variation is not more than may be expected as resulting from different positions on the cone and from different degrees of development. All possess a single prolonged tip, and bear the impression of a single centrally situated seed. In some, the position of the ligule is well seen. Similar scales occur throughout the Mesozoic.

ANGIOSPERMOPHYTA

? Angiosperm

A portion of a leaf possessing a lobed orbicular outline, with deeply cordate base, is thought to be an *Angiosperm*. There is no midrib, two or three primary veins arising from the petiole and diverging into the lamina. The specimen is only a fragment, and is insufficient to ascertain the genus.

Angiosperm

A single specimen in the upper mudstone horizon of the Runnymede Formation is undoubtedly portion of an *Angiosperm* leaf. The leaf is incomplete, linear lanceolate, and almost 2 cm. wide at the broadest part. The midrib is distinct, and secondary veins are widely spaced and alternate. The preservation is not sufficiently good to determine the nature of the veins between these main veins.

The material at present available is not adequate for generic determination. Vegetative characters are notoriously inadequate as criteria of genera and species. Even combining these with the generally considered strongly diagnostic features of the stoma does not ensure accurate generic determination of *Angiosperms* (see Odell, 1932). Fruits, seeds, or pollen must be present if more than form genera are to be ascertained.

Age of the Flora

The flora described below is unlike any previously recorded from Victoria. The assemblage in the Mocomboro mudstone member differs from that in the Runnymede Formation, and although *Phyllopteroides* is common to the two collections, different species are present in each horizon.

A. The Mocomboro Mudstone Member

In the collection examined, by far the most abundant plant was *Phyllopteroides,* single overlapping leaves completely covering the bedding planes at intervals of a few millimetres. Plants related to *Phyllopteroides* are known only from the Mesozoic, Walkom recording "*Phyllopteris*" from the Burrum and Styx Series of Queensland, and the closely related *Linguifolium* Arber occurring in the Rhaetic and Jurassic of New Zealand, the Ipswich Series of Queensland, the Triassic of Tasmania, and the Rhaetic of southern Chile and southern Mexico.

Phyllopteroides dentata is present in the Victorian Lower Jurassic, being recorded from Allot. 49, Jumbunna, and from the Barrabool Hills. It is also found, with *Sphenopteris,* at Barangarook Creek, Colac. From several Jurassic localities, doubtful records have been made, the original specimens of which have not been traced, but the names and descriptions given them by earlier workers are strongly suggestive of their inclusion in *Phyllopteroides.* (See Medwell, 1954.)

Sphenopteris and *Brachyphyllum* are of little use in determining the age of the flora.

The narrow *Taeniopteris—Taeniopteris spatulata*—is a common and characteristic Jurassic plant, being recorded from Africa, India, New Zealand, New South Wales and Queensland, and is the most abundant plant in the Victorian Lower Jurassic. It is present in the Waikato Heads flora of New Zealand (which Arber, (1917) placed as Neocomian, but which Edwards (1934) suggests is Middle Jurassic), and has also been recorded from the Burrum and Styx Series of Queensland (Walkom, 1919).

Thus the flora of the lower plant horizon at Killara is of strongly Mesozoic aspect. The presence of *Taeniopteris spatulata* indicates Jurassic age. The complete absence of most of the plants common in the Victorian Lower Jurassic, the presence of only two small specimens of *Taeniopteris spatulata,* and the abundance of *Phyllopteroides,* which is extremely rare in the Lower Jurassic of Victoria and occurs in the Cretaceous of Queensland, suggest that the flora of the Mocomboro mudstone member may be placed in the Upper Jurassic.

B. Upper Mudstones of the Runnymede Formation

The flora of this bed is quite distinct from that of the Mocomboro mudstone member. *Phyllopteroides dentata,* which makes up the bulk of the material in the lower bed, is absent or very rare; *Phoenicopsis* and *Araucarites* make their appearance; and there is the notable occurrence of two *Angiosperms.*

The presence of these *Angiosperms* suggests that the age of the horizon is Cretaceous. Further evidence of Cretaceous age is given by the presence of *Phyllopteroides lanceolata* and *Sphenopteris burrumensis,* both of which also occur in the Burrum Series of Queensland, whose flora Walkom declares to be a typically Lower Cretaceous one, being homotaxial with the European Wealden and the Neocomian of North America. *Phyllopteroides lanceolata* is also present in the Styx Series, which Walkom places as somewhat younger than the Burrum Series, representing a higher stage in the Lower Cretaceous.

Phoenicopsis and *Araucarites* are of little use an indices of age. Cone scales of *Araucarites cutchensis* have a wide range in space and time, being recorded from beds ranging from Rhaetic to Cretaceous.

The age of the upper mudstones of the Runnymede Formation is therefore placed as Lower Cretaceous.

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Explanation of Plates

Plate II

Fig. 1.—*Phyllopteroides lanceolata* (Walkom 1919). Runnymede Formation. No. 2010.
Fig. 2.—Fan-shaped pinnules (see p.). Mocomboro mudstone member. No. 2017.
Fig. 3.—*Taeniopteris spatulata.* Mocomboro mudstone member. No. 2018.
Fig. 4.—*Phyllopteroides dentata,* n. sp. Mocomboro mudstone member. Holotype, No. 2005.
Fig. 5.—*Phyllopteroides dentata* n. sp. Mocomboro mudstone member, No. 2011.

Plate III

Figs. 6 & 7.—*Angiosperm.* Runnymede Formation. No. 2013.
Fig. 8.—? *Angiosperm.* Runnymede Formation. No. 2014.
Figs. 9 & 10.—*Phoenicopsis elongatus.* Runnymede Formation. Nos. 2015, 2016.